DESCRIPTION

HERMETIC TYPE COMPRESSOR

TECHNICAL FIELD

The present invention relates to a hermetic type compressor mounted in a freezing, refrigerating or air conditioning apparatus such as a refrigerator, showcase and the like.

BACKGROUND ART

With recent increase in prevalence of low-noise type household refrigerators, there is a strong demand for noise reduction of a hermetic type compressor.

In some of conventional hermetic type compressors, the suction pressure pulsation is attenuated by a silencer function configured on a suction muffler (e.g. refer to Japanese Laid-open Patent Application No. 2002-227766).

The conventional hermetic type compressor will be described in the following with reference to the drawings.

Fig. 5 is a sectional view of a conventional hermetic type compressor, and Fig. 6 is an exploded view of an essential portion of the hermetic type compressor of Fig. 5.

In Fig. 5 and Fig. 6, electric motor unit 2 and compressing unit 3 driven by it are housed in hermetic container 1.

Cylinder 5 is disposed in cylinder block 4 which configures compressing unit 3, and piston 6 is fitted in cylinder 5 in a state of being reciprocally movable. Sheet-like plate 7 is formed with suction hole 8 and discharge hole 9, which also seals the end of cylinder 5. Suction muffler 10 made of plastics comprises opening 11

formed in hermetic container 1, silencing space 12 forming an expansion muffler, and connection pipe 13 which communicates the inside of silencing space 12 to suction hole 8.

Cylinder head 18 is configured so as to cover the plate 7, forming discharge chamber 19 formed with discharge hole 9, housing section 20 for housing connection pipe 13, and resonance chamber 22 which forms resonance space 21.

Connection pipe 13 is provided with passage 15 which communicates with resonance chamber 22, and a resonance muffler is formed by resonance chamber 22 and passage 15.

The operation of a hermetic type compressor (hereafter called compressor) configured as described above will be described in the following.

Compressing unit 3 is driven by electric motor unit 2, and piston 6 is reciprocally moved in cylinder 5, then the refrigerant gas returned to hermetic container 1 from a freezing cycle (not shown) is taken into silencing space 12 from opening 11 of suction muffler 10, which is taken into cylinder 5 via suction hole 8 passing through connection pipe 13. And, the refrigerant gas compressed by the reciprocal motion of the piston is discharged from discharge hole 9 into discharge chamber 19, and again delivered to the freezing cycle (not shown).

In this case, the refrigerant gas taken into cylinder 5 via suction hole 8 is intermittently inhaled as piston 6 is reciprocally moved in cylinder 5, and it is therefore accompanied by pressure pulsation, but the pressure pulsation is attenuated due to the expansion muffler effect in silencing space 12 and the resonance muffler effect of resonance space 21. As a result, the noise generated due to pressure pulsation can be lowered.

However, in the above conventional configuration, the suction pressure

pulsation in resonance space 21 sometimes leaks from gaps between connection pipe 13 and housing section 20, and in case the level of leaked pressure pulsation energy is high, there arises a problem that it will cause the inside of hermetic container 1 to be excited and the noise to be amplified.

DISCLOSURE OF THE INVENTION

This invention provides a hermetic type compressor comprising a hermetic container which accommodates stored oil, an electric motor unit, and a compressing unit, wherein the compressing unit comprises a cylinder for housing a reciprocally moving piston, a plate disposed at the end of the cylinder, a suction muffler having a connection pipe communicating to the suction hole in the plate, and a cylinder head disposed at the anti-cylinder side of the plate and formed with a discharge chamber and a resonance chamber which includes a part of the connection pipe, and a flange disposed at the outer periphery of the connection pipe is fitted in a groove formed at a position corresponding to the flange of the cylinder head, thereby forming a seal portion.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a sectional view of a hermetic type compressor in the preferred embodiment 1 of the present invention.

Fig. 2 is an exploded perspective view of an essential portion of a hermetic type compressor in the preferred embodiment 1.

Fig. 3 is a perspective view of a suction muffler in the preferred embodiment 1.

Fig. 4 is an essential assembly diagram of the suction muffler of Fig. 2 in the preferred embodiment 1.

Fig. 5 is a sectional view of a conventional hermetic type compressor.

Fig. 6 is an exploded perspective view of an essential portion of a conventional hermetic type compressor.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The preferred embodiments of the present invention will be described in the following with reference to the drawings. Same components as those in the conventional example are given same reference numerals, and the detailed description is omitted.

(Preferred Embodiment 1)

Fig. 1 is a sectional view of a hermetic type compressor in the preferred embodiment 1 of the present invention. Fig. 2 is an exploded perspective view of an essential portion of a hermetic type compressor in the preferred embodiment 1. Fig. 3 is a perspective view of a suction muffler in the preferred embodiment 1. Fig. 4 is an essential assembly diagram of the suction muffler of Fig. 2 in the preferred embodiment 1.

In Fig. 1 to Fig. 4, oil 101 and refrigerant gas (not shown) are sealed in hermetic container 1 formed by drawing a steel plate in which electric motor unit 2 and compressing unit 103 driven by same are accommodated. Also, hermetic container 1 is formed with plane portion 1A where a member (not shown) is installed for fitting the hermetic container 1 on a substrate (not shown) or the like.

Cylinder 5 is disposed in cylinder block 4 of compressing unit 103, and piston 6 is fitted in cylinder 5 in such manner that it is freely reciprocally movable.

Sheet plate 7 has suction hole 8 and discharge hole 9, and serves to seal the end of the cylinder.

Suction muffler 110 made of PBT (polybutylene terephthalate) resin enhanced in heat resistance, oil resistance and refrigerating capacity by mixing in glass fiber by about 15% comprises generally cubic opening 111 with one side opened in hermetic container 1, silencing space 112 forming an expansion muffler, and connection pipe 113 which communicates the inside of silencing space 112 to suction hole 8.

Opening end 114 of connection pipe 113 is provided with groove-like passage 115 which communicates between the inside and outside of opening end 114 and has a predetermined sectional area and length, and also formed with generally semi-circular ring-like seat 116. Further, connection pipe 113 is formed with generally U-shaped flange 118 extended to the outer periphery side except the surface of opening end 114 side. Also, oil hole 119 is formed at the bottom of silencing space 112 that is located above flange 118.

Cylinder head 123 is made of aluminum die-cast that is a relatively inexpensive material, which is configured so as to cover the plate 7, and formed with housing section 125 where discharge chamber 124 having discharge hole 9 and connection pipe 113 are housed.

Housing section 125 is provided with generally semi-circular resonance chamber 128 formed in such manner that ring-like seat 116 is disposed along the inner wall, and generally U-shaped groove 129 is formed at a position corresponding to flange 118, in which flange 118 is fitted with slight clearance.

With suction muffler 110 and cylinder head 123 engaged with each other, flange 118 is fitted in groove 129, thereby forming seal portion 130. Also, plate 7, the outer periphery of connection pipe 113, the inner periphery of ring-like seat 116, and the inner wall of resonance chamber 128 make up space 132, and resonance

muffler 140 is formed by space 132 and passage 115.

And cylinder head 123 is bolted to cylinder block 4 via plate 7, and thereby, suction muffler 110 is press-fitted and secured on plate 7 by cylinder head 123 via spring 142.

Also, plane portion 1A of hermetic container 1 has a resonance frequency of about 2.5 kHz, and the resonance frequency of opening 111 is set to about 1.6 kHz so that it does not coincide with the resonance frequency of plane portion 1A.

On the other hand, resonance muffler 140 is tuned to nearly same resonance frequency as for opening 111.

The operation of the compressor having the above configuration will be described in the following.

When power is supplied to electric motor unit 2, compressing unit 103 is driven and piston 6 is reciprocally moved in the cylinder, then the refrigerant gas returned to hermetic container 1 from freezing cycle (not shown) is taken into silencing space 112 from opening 111 of suction muffler 110, and it is taken into cylinder 5 from connection pipe 113 via suction hole 8. And, the refrigerant gas compressed by the reciprocal motion of piston 6 is discharged from discharge hole 9 into discharge chamber 124, and again delivered to the freezing cycle (not shown).

In this case, the refrigerant gas taken into cylinder 5 via suction hole 8 is intermittently inhaled as piston 6 is reciprocally moved in cylinder 5, and it is therefore accompanied by strong pressure pulsation. The pressure pulsation is greatly attenuated due to the effect of expansion muffler in silencing space 112 disposed in suction muffler 110 and the effect of resonance muffler 140.

Also, the pressure pulsation remaining in resonance muffler 140 is prevented from leaking into hermetic container 1 because resonance muffler 140 is isolated by

seal portion 130 from the inside of hermetic container 1, thereby preventing the vibration from being propagated to the refrigerant gas in hermetic container 1. As a result, the effective function of the expansion muffler and resonance muffler 140 enables the reduction of noise.

Seal portion 130 is formed by flange 118 and groove 129 engaging each other, and since the total distance from the upper and lower surface of flange 118 to the outer periphery corresponds to the effective length of seal width, it is possible to assure a sufficient seal width and to obtain an excellent sealing effect.

On the other hand, when engaging suction muffler 110 with cylinder head 123, since flange 118 is generally U-shaped, R of the shoulder of flange 118 allows it to be easily fitted in groove 129, assuring excellent workability.

Also, the refrigerant gas inhaled from opening 111 contains mist-like oil (not shown), and the oil is separated from the refrigerant gas in silencing space 112. The separated oil stays at the bottom of suction muffler 110 and drips from oil hole 119 onto seal portion 130. Consequently, the oil gets into slight clearance created by seal portion 130, thereby sealing it to improve the sealing effect remarkably, and there is almost no leakage of pressure pulsation remaining in resonance muffler 140, and the effect of the expansion muffler and the effect of resonance muffler 140 are further enhanced, enabling the reduction of noise.

Resonance chamber 128 is formed in such manner that generally semi-circular ring-like seat 116 arcuately extended to the discharge chamber 124 side is disposed along the inner wall, and therefore, the volume of resonance chamber 128 can be maximized within a limited space without lessening the space volume of discharge chamber 124. As a result, the effect of resonance muffler 140 can be enhanced, and greater silencing effect can be obtained. At the same time, ring-like seat 116

disposed along the inner wall of resonance chamber 128 effectively regulates the rotational movement about the axis of connection pipe 113. In this way, when suction muffler 110 is press-fitted and secured on plate 7, it is well seated, that is, suction muffler 110 is reliably fixed at a predetermined position. As a result, it is possible to prevent vibrant noise generated due to looseness between plate 7 and suction muffler 110.

In the preferred embodiment 1, since resonance muffler 140 is tuned to a resonance frequency of about 1.6 kHz nearly the same as for opening 111, the resonance noise at opening 111 is remarkably attenuated. Consequently, it brings about an effect of greatly lowering the noise that is generated when the resonant portion of the hermetic container is excited by opening 111 being the source of excitation.

In addition, plane portion 1A formed in hermetic container 1 is poor in rigidity, and as a result, if excited by the number of vibrations inherent to plane portion 1A, the portion will be liable to resonate, giving rise to the generation of great noise. However, in the preferred embodiment 1, as described above, the resonance frequency of opening 111 that is liable to become the source of excitation is not coincident with the number of vibrations inherent to plane portion 1A, that is, they are independent of each other. Accordingly, the exciting force from opening 111 does not amplify the vibration of plane portion 1A of hermetic container 1 that is most liable to resonate, and it is possible to suppress the generation of noise.

Because of the structure of suction muffler 110, it internally has various space intervals, and therefore, the noise may be sometimes greatly amplified depending upon the wavelength of noise passing therethrough. In such a case, the amplified noise can be attenuated by making the noise at the frequency coincident with the

resonance frequency of resonance muffler 140, and such means is also very effective to realize the reduction of noise.

The effect in the present preferred embodiment can be similarly obtained with respect to refrigerant gas and oil being compatible with it which are used in a freezing or air conditioning apparatus such as a refrigerator and showcase.

INDUSTRIAL APPLICABILITY

The present invention relates to a hermetic type compressor mounted in a freezing, refrigerating or air conditioning apparatus such as a refrigerator, showcase and the like. The resonance chamber is isolated from the inside of the hermetic container by the flange provided with a suction muffler and the seal portion having a groove disposed in the cylinder head, and the suction pressure pulsation hardly leaks into the hermetic container, thereby enabling the reduction of noise.